

Advanced Topics in Forensic DNA Analysis
New Jersey State Police DNA Laboratory Training Workshop
December 5-6, 2006

Instructor: John M. Butler (NIST)

Material based largely on Butler, J.M. (2005) *Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers*. Elsevier Academic Press: New York.

December 5, 2006 (Tuesday)

9:00 – 9:20 a.m. **Introductions** by instructor and participants

9:20 – 10:30 a.m. **ABI 310/3100/3130 Capillary Electrophoresis Fundamentals**

Advantages of capillary electrophoresis and historical perspectives
ABI Genetic Analyzer instrument overview: differences between ABI 310/3100/3130xl
Sample preparation, injection, separation, and detection

10:30 – 10:45 a.m. **BREAK**

10:45 a.m. – 12:15 p.m. **CE Troubleshooting**

Deciphering artifacts from true alleles: dye blobs, spikes, pull-up
External factors: temperature shifts and impact on sizing precision
Instrument problems: capillary clogging, syringe leaks
Troubleshooting benchmarks/QC monitoring (current and syringe travel)

12:15 p.m. – 1:15 p.m. **LUNCH**

1:15 – 2:45 p.m. **Mixture Interpretation**

Sample interpretation overview
NIST MIX05 interlab study results
Discussion

2:45 – 3:00 p.m. **BREAK**

3:00 – 4:30 p.m. **qPCR and Low-Copy Number DNA Testing**

Real-time PCR and DNA quantitation
Issues and challenges with low-copy number DNA testing

4:30 – 5:00 p.m. Q&A as needed

Outline for NJSP Training Workshop (December 5-6, 2006)

December 6, 2006 (Wednesday)

9:00 – 9:30 a.m. **miniSTRs**

miniSTRs – tools for improving recovery from degraded DNA
MiniFiler kit and concordance studies
Characterization of 26 new miniSTR loci at NIST
New European core STR loci – D2S441, D10S1248, D22S1045

9:30 – 10:30 a.m. **Essentials of Validation**

Urban Legends of Validation
Validation definitions and requirements for documentation
Some examples

10:30 – 10:45 a.m. **BREAK**

10:45 – 12:15 a.m. **Fundamentals of Statistics and Population Genetics**

How population databases are constructed and validated
Calculating random match probabilities
Issues of relatedness and mixture statistics
Parentage and kinship analysis

12:15 – 1:15 p.m. **LUNCH**

1:15 – 3:00 p.m. **Mitochondrial DNA**

mtDNA background, structure, and function
HV1 & HV2 details
LINEAR ARRAYs as potential screening assays
mtGenome sequencing to address most common types

3:00 – 3:15 p.m. **BREAK**

3:15 – 4:30 p.m. **Y-Chromosome Analysis**

Lineage markers
Y-STR loci and commercial kits
Duplications and deletions

Q&A as needed throughout the various presentations